Original Article

COMPARSION OF AMOUNT OF MARGINAL RIDGE REDUCTION FOR REST SEAT PREPARATION BY THREE TYPES OF CLINICIANS

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ABSTRACT

Objective: *The aim of this study was to compare the marginal reduction of a rest seat prepared for a cast chromium cobalt removable partial denture by three groups of clinicians (house surgeons, trainees and consultants.*

Material and Methods: *Thirty five clinicians divided into three groups; Group A having 15 house surgeons, group B contained 15 FCPS residents and group C having 5 consultants were the participants. The mandibular molars and premolars were prepared for removable partial denture. Only those teeth which were sound having no occlusal caries and no severe tipping to the edentulous spaces was included. Patients with limited mouth opening were excluded from the study. After completion of preparation impression was taken in alginate material, poured in dental stone (Dentamerica) and intercuspation wax bite (Cavex modeling) was registered. Thickness of wax in marginal area of rest was measured in millimeter using Iwanson's gauge (Japan).*

Results: *Both the house surgeons and trainees prepared the mandibular molars and premolar less than ideal. The comparison for amount of marginal ridge reduction of molars and premolars by clinicians shows that the difference was significant (P<0.05). The mean marginal ridge reduction for premolars was 0.9±0.17 mm by house surgeons, 1.15±0.18 mm by FCPS residents and 1.34±0.114 mm was by consultants.*

Conclusions: *The experience has an important role in reducing marginal ridge. While preparing marginal ridge area for removable partial denture, it is of paramount importance to measure and achieve adequate preparation for fabricating successful removable partial denture.*

Key words: *Occlusal rest, Removable partial denture, Rest seat preparation*

INTRODUCTION

The shifting pattern of dental pathology in the UK has resulted in the retention of teeth for far longer than has previously been the case[1]. Because of this there are currently more partial dentures made than complete ones. Dental Practice Board data show that there has been a gradual decline in the use of dentures under the NHS during the past decade, with a reduction of 47% for complete dentures and 25% for partial dentures[2]. The potential benefits of removable partial denture (RPDs) are their contribution to the appearance, speech, mastication, maintaining the health of the masticatory system, preventing undesirable tooth movement, improving distribution of occlusal load and Preparation for complete dentures[3].

One of the most popular methods since 1970 for the replacement of missing teeth was RPD, whereas many dentists consider it a prosthetic rehabilitation of the second class. Also according to some studies RPD are not recommended for all patients, especially in patients where teeth mobility had not >1 mm[4]. However a well designed RPD can be used in many patients[5, 6]. RPD are generally attached to the abutment natural teeth by clasps or attachments that hold the denture in place[7].

It is clear from studies that there is a fundamental problem with the design and fabrication process of a variety of prostheses in general dental practice, most notably relating to cobalt-chromium removable partial

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dentures[8,9].

Kennedy[10] in 1807, improved the Bonwill's fundamental principles of clasp design, namely encirclement and 3-point contact for effective clasping and retention. Bonwill's 3 points of contact were the ends of each of 2 clasp arms and a resting lug, the predecessor of the modern rest. The purpose of the resting lug was to support a partial denture and serve as a contact point to prevent food being packed between the clasp and tooth. The resting lug was bent from the body of a flat plate or round wire clasp and was often strengthened with solder. The preferred position for the lug was on the occlusal surface; however, preparation of a rest seat in the tooth surface was deemed necessary only if there was insufficient space for the lug[11].

Kratochvil[12] described a similarly shaped rest seat and suggested that the width should be 1.9–2.3 mm. Where there is inadequate inter-occlusal space or the enamel thickness is insufficient for a rest seat minor adjustment of the opposing tooth may be needed[13]. In summary, an occlusal rest seat preparation should be smooth and saucer-shaped; about 1 mm thick; and around 1/3 width and 1/3 the length of the tooth. Much longer rests, extending for more than half the mesio-distal width of a tooth, have been occasionally advocated and particularly where a rotational path of insertion is selected for the denture[14]. Adequate marginal ridge reduction is mandatory to achieve proper thickness of minor connectors to give support to occlusal rest. Recommended depth of occlusal rest: 1.0mm to 1.5mm at the marginal ridge[15].

With the shifting paradigm of therapy it is suitable to check the capability of the present dentist to adequately provside this sort of care. The preparation of an adequate denture support impinges greatly on the long-term success of the prosthesis and the health of the remaining teeth. So the aim of this study was to compare the marginal reduction of a rest seat prepared for a cast chromium cobalt removable partial denture by three groups of clinicians (house surgeons, trainees and consultants)

METHODS AND MATERIALS

This cross sectional comparative study was conducted at the department of Prosthodontics, Khyber College of Dentistry, Peshawar. A total of 35 clinicians were included in this study. These were divided into three groups on the basis of experience. Group A had 15 house surgeons, group B contained 15 FCPS residents (TMOs) and group C consisted of 5 consultants (FCPS qualified).

After explaining the purpose of study informed consent was taken from all patients. The mandibular molars and premolars were prepared for cast removable partial denture of cobalt chromium. Only those teeth that were sound having no occlusal caries and no severe tipping to the edentulous spaces were included. Patients with limited mouth opening were excluded from the study. All the clinicians prepared occlusal rest seat either from mesial or distal side in molars/ premolar teeth using tapered diamond stone. After completion of preparation for cast RPD an impression was taken in alginate material (Hydrogum) and poured in dental stone(Dentamerica) within 3 minutes for both arches. Wax bite (Cavex modeling) was registered in centric occlusion. Both stone models were articulated with semi-adjustable articulator using bite registration. Wax was placed into each models and the thickness of wax in marginal area of rest were measured in millimeter using Iwanson's gauge gently having least count upto 0.01mm.

Data were analyzed using SPSS version 20.0. Mean and standard deviation was calculated for amount of marginal ridge reduction. One way ANOVA was applied to compare the amount of marginal ridge reduction by three groups of clinicians. $P<0.05$ was considered significant.

RESULTS

Thirty-five clinicians prepared the molars and premolars in mandibular arch. Fifteen were house surgeon , 15 were FCPS residents and 5 were consultants. The mean marginal ridge reduction for molars was 1 ± 0.2 mm by house surgeons, 1.16 ± 0.19 mm by FCPS residents and 1.3 ± 0.15 mm was by consultants. So only consultants prepared the marginal ridge close to the ideal(1.5mm). Both the house surgeons and trainees were preparing less than ideal the mandibular molars. (Table 1)

The mean marginal ridge reduction for premolars was 0.9 ± 0.17 mm by house surgeons, 1.15 ± 0.18 mm by FCPS residents and 1.34 ± 0.114 mm was by

consultants. Only consultants prepared the premolars near to the ideal. (Table 2)

The comparison of amount of marginal ridge reduction of molars by clinicians shows that the difference was significant (P=0.009) (Table 3). Post-hoc analysis shows that the difference between house surgeons and trainees was not significant (P=0.072) but between house surgeons and consultants was significant (P=0.13). The difference between trainees and consultants was also non-significant (P=0.346). (Table 4)

For premolar the difference in marginal ridge reduction was also statistically significant among three types of clinicians (P=0.00) as shown in table 5. Post-hoc analysis for premolars marginal ridge reduction shows that the difference was significant between house surgeons and trainees (P=0.001) as well as consultants (P=0.000). But the difference between trainees and

Table 1: Descriptive statistics of molar teeth by three different types of clinicians

Amount of marginal ridge reduction	N	Minimum	Maximum	Mean	Std. Deviation
House surgeon	15	.70	1.30	1.0000	.20000
Trainee	15	.90	1.50	1.1600	.19198
Consultant	5	1.10	1.50	1.3000	.15811

Table 2: Descriptive statistics for premolar teeth by three different types of clinicians

Amount of marginal ridge reduction	N	Minimum	Maximum	Mean	Std. Deviation
House surgeon	15	.60	1.20	.9000	.17728
Trainee	15	.90	1.50	1.1533	.18848
Consultant	5	1.20	1.50	1.3400	.11402

Table 3: Comparison of amount of marginal ridge reduction for molars by clinicians

	Sum of Squares	df	Mean Square	F	Sig.*
Between Groups	.399	2	.200	5.434	.009
Within Groups	1.176	32	.037		
Total	1.575	34			

*one way ANOVA

Table 5: Comparison of amount of marginal ridge reduction in premolar teeth by clinicians

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	.902	2	.451	14.589	.000
Within Groups	.989	32	.031		
Total	1.891	34			

*one way ANOVA

Table 4: Post-hoc analysis for comparison of amount of marginal ridge reduction for molar teeth by the clinicians

(I) clinician	(J) clinician	Mean Difference (I-J)	Std. Error	Sig.*	95% Confidence Interval	
					Lower Bound	Upper Bound
House Surgeon	Trainee	-.16000	.07000	.072	-.3320	.0120
	Consultant	-.30000*	.09899	.013	-.5433	-.0567
Trainee	House Surgeon	.16000	.07000	.072	-.0120	.3320
	Consultant	-.14000	.09899	.346	-.3833	.1033
Consultant	House Surgeon	.30000*	.09899	.013	.0567	.5433
	Trainee	.14000	.09899	.346	-.1033	.3833

- The mean difference is significant at the 0.05 level., Tukey test of Honesty

Table 6: Post-hoc analysis for comparison of amount of marginal ridge reduction of premolar teeth by the clinicians

(I) clinician	(J) clinician	Mean Difference (I-J)	Std. Error	Sig.*	95% Confidence Interval	
					Lower Bound	Upper Bound
House Surgeon	Trainee	-.25333*	.06420	.001	-.4111	-.0956
	Consultant	-.44000*	.09080	.000	-.6631	-.2169
Trainee	House Surgeon	.25333*	.06420	.001	.0956	.4111
	Consultant	-.18667	.09080	.115	-.4098	.0365
Consultant	House Surgeon	.44000*	.09080	.000	.2169	.6631
	Trainee	.18667	.09080	.115	-.0365	.4098

* The mean difference is significant at the 0.05 level

consultants were non-significant (P=0.115). (Table 6)

DISCUSSION

The rest is that part of a partial denture that rests on a tooth surface, providing vertical support for the removable partial denture. It transmits some or all of the forces from the saddle area of a denture to the abutment tooth[16]. Partial dentures not supported by teeth can have detrimental effects on the underlying soft tissue. Masticatory forces on a denture that finishes adjacent to or over the gum margin and cervical to the suprabulge area of the tooth will have an effect of stripping the gum away from the tooth over time, causing irreversible damage to the periodontium[11,17].

The amount of marginal ridge reduction by both the house surgeons and trainee medical officers are reducing marginal ridge in both premolars and molars less required i.e. about 1mm. It is due to the reasons they are less experienced. Cassim et al[18] reported that depth, width and length of occlusal rest seat preparations and the thickness of the cast metal rests was prepared less than required by dental students. However, they did not record marginal ridge reduction.

In the current study the amount of marginal ridge reduction was statistically different among the clinicians and only consultants were preparing closer to required level (1.3 mm). This due to the fact the consultants have much more experience and theoretical background. However, Culwick et al[19] reported that the size and shape of the rest seat preparations varied widely between the dentists taking part in the study, however no statistical difference was found between academic staff and postgraduate groups for any of the measurements. As a result their data was combined. The new Staff + PG group prepared larger rest seats than their general dental practitioner colleagues, being wider and longer and with a greater support area. These differences were significant. There was no statistical difference in the depth of the prepared rest seat between the two groups. Culwick et al[19] study differed from the current study but they did not mention marginal ridge reduction specifically.

Rice et al[14] examined tooth preparations made by general dental practitioners (GDPs) for occlusal and cingulum rest seats for removable partial dentures (RPDs). Rest seats and associated interocclusal clearances were assessed using pre-determined criteria. Using pre-determined criteria, 60% of rest seats were under-prepared in the mesio-distal plane(marginal ridge area) and 30% were over-prepared in the bucco-lingual plane. In cases where natural teeth opposed the rest seat, the mean interocclusal clearance was 1.5 mm (range 0.6-3.5 mm) with 6 of the 17 rests (35%) being less than the recommended thickness. Where prescribed, the majority of rests did not meet the identified criteria. These results are similar to our study.

CONCLUSION

From this study sample we can conclude that both house surgeons and trainee are preparing less than prescribed amount of marginal ridge in molars and premolars. The experience has its role in reducing marginal ridge. While preparing marginal ridge area for removable partial denture, it is of paramount importance to measure and achieve adequate preparation for fabricating successful RPD.

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